

INTERNATIONAL COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing: 01 March 2001 (01.03.01)	
International application No.: PCT/EP00/05708	Applicant's or agent's file reference: M.ROBERTS 7-
International filing date: 20 June 2000 (20.06.00)	Priority date: 20 August 1999 (20.08.99)
Applicant: ROBERTS, Michael et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International preliminary Examining Authority on:
11 November 2000 (11.11.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer: J. Zahra Telephone No.: (41-22) 338.83.38
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REC'D 28 SEP. 2001

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference M.ROBERTS 7-9		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/EP00/05708	International filing date (day/month/year) 20/06/2000	Priority date (day/month/year) 20/08/1999	
International Patent Classification (IPC) or national classification and IPC H04Q7/22			
Applicant LUCENT TECHNOLOGIES INC.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 11/11/2000	Date of completion of this report 26.09.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Möll, H-P Telephone No. +49 89 2399 8243 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05708

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1,3-5,8,10-12	as originally filed			
6,7,9	as received on	03/04/2001	with letter of	30/03/2001
2,2a	as received on	17/09/2001	with letter of	13/09/2001

Claims, No.:

1-3	as received on	17/09/2001	with letter of	13/09/2001
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Drawings, sheets:

1/4-4/4	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP00/05708

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	— Yes:	Claims	1-3
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-3
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-3
	No:	Claims	

**2. Citations and explanations
see separate sheet**

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/05708

Cited Documents

1. Reference is made to the following documents (**D1**, **D2**) in this International Preliminary Examination Report:

D1: "Architectural Aspects for the Evolution of Mobile Communications toward UMTS"

E. Berruto et al;

IEEE Journal on Selected Areas in Communications,

US, IEEE INC. New York, vol. 15, no. 8, 01.10.1997, pages 1477-1486

D2: GB-A-2 315 193 (21.01.1998)

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The present application concerns a "packet switched mobile network architecture with a location area connected by a radio access network to at least two core networks having differing functionality" according to the preamble of independent **Claim 1**. The radio access network comprises switching means to switch packet transmissions from a mobile terminal in the location area to one of the at least two core networks. A second independent Claim is directed towards the respective "method of switching packet transmissions in a packet switched mobile network" (**Claim 3**) and includes the method features corresponding to the apparatus features of **Claim 1**.
2. The nearest prior art document **D1** presents concepts for the evolution of mobile communications toward UMTS and discloses a Generic Radio Access Network proposal in which the UMTS radio access part can interface with different core networks such as GSM, N/B-ISDN and Internet.

A further prior art document **D2** cited in the International Search Report discloses a public mobile communications network including a private network portion to which only selected mobile stations have access. The private network portion is implemented by providing either only an additional BTS or an additional BTS plus an additional BSC. Insufficient capacity problems in the private network portion can be alleviated by servicing overflows via the main network portion.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP00/05708

3. The present application deals with the technical problem of flexibly making use of the resources provided by the different core networks of a packet switched mobile network architecture.
4. The present application solves the above-mentioned technical problem by providing switching means in the radio access network to switch packet transmissions from a mobile terminal in the location area to one of the at least two core networks in dependence on the capacity of the respective core networks.
5. As none of the cited prior art references discloses all the features as defined by independent **Claims 1 and 3**, said **Claims 1 and 3** both meet the requirements of Article 33(2) PCT regarding **novelty**.
6. Furthermore, the subject-matter of **Claims 1 and 3** is not suggested or rendered obvious by any of the cited prior art references. Although, document **D2** mentions routing calls from a private mobile station to either the public network portion or the private network portion in order to relieve congestion, it is not considered to be obvious to combine **D2** with **D1** as **D2** shows a totally different network architecture (common core network / different base station subsystems) and solves a different problem. Independent **Claim 1** thus also meets the requirements of Article 33(3) regarding **inventive step**.
7. As a consequence, **Claim 2**, as being directly dependent on **Claim 1** also meets the requirements of Article 33(2) and (3) PCT regarding **novelty** and **inventive step**.
8. Furthermore, independent **Claims 1 and 3** and dependent **Claim 2** all meet the requirement of Article 33(4) PCT regarding **industrial applicability**.

with the particular radio access type. Changing between two radio access systems involves additional signalling and can also lead to outages during the transition between the two systems. The impact of the additional signalling and outages depends on the network architecture and the protocols chosen.

5 In addition, if a mobile terminal operating in the 3G mode of operation moves out of 3G coverage, then there is a consequential degradation in service when communication with the 2G core network is established.

It is known from Berruto E Et Al: "Architectural Aspects for the Evolution of Mobile Communications Toward Umts" IEEE Journal on selected areas in
10 communications, US, IEEE, Inc. New York, vol. 15, no. 8 1 October 1997 (1997-10-01), pages 1477-1486, XP000721279 ISSN: 0733-8716, to provide a packet switched mobile network architecture comprising a radio access network connecting to at least two core networks having differing functionality.

It is an object of the present invention to provide an improved network
15 architecture for packet switched networks.

Summary of the Invention

According to the present invention there is provided a packet switched mobile network architecture comprising a location area connected by a radio access network to at least two core networks having differing functionality, wherein the
20 access network comprises switching means operative to switch packet transmissions from a mobile terminal in the location area to one of the at least two core networks in which the switching means is operative to switch packet transmissions from the mobile terminal to one of the at least two core networks in dependence on the capacity of the respective core networks.

25 The core network may include a MSC comprising a VLR, the capacity of the respective core networks being determined by the capacity of the VLR.

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According to the present invention there is also provided a method of switching packet transmissions in a packet switched mobile network comprising a location area connected by a radio access network to at least two core networks having differing functionality, the method comprising switching by the radio access network of
5 packet transmissions from a mobile terminal in the location area to one of the at least two core networks in dependence on the capacity of the respective networks.

The invention will now be described by way of example with reference to the accompanying drawings, in which:

coverage area is also still distinctly defined. The common location area LA3 is comprised of 2G cells, but the network architecture allows mobile terminals in those cells having 3G functionality to connect to a core network having 3G functionality, as will be discussed further hereinbelow.

- 5 The location area LA 2 is comprised of 3G cells as in Figure 2, and enables the mobile terminals in the location area LA2 having 3G functionality to connect to the 3G core network 212 via the UTRAN 210 radio access network as before.

10 The 2G BSS 204 of Figure 2 is modified for the implementation of Figure 3, and thus the 2G BSS in Figure 3 is designated by reference numeral 302. The 2G BSS 302 is provided with an additional A interface labelled A' and designated by reference numeral 306, which connects the 2G BSS 302 to the 3G MSC in the 3G core network. The 2G BSS 302 is also provided with an additional Gb interface labelled Gb' and designated by reference
15 numeral 304, which connects the 2G BSS 302 to the 3G SGSN in the 3G core network.

In accordance with the new network architecture of Figure 3, the BSS 302 directs packet transmissions from mobiles in the combined location area LA3 300 to either the 2G core network or the 3G core network. Similarly,
20 in the other direction the BSS 302 directs packet transmissions from the 2G or 3G core network to mobile terminals in the combined location area LA3.

In accordance with the implementation of the network architecture shown in Figure 3, the radio access network comprising the BSS 302 switches
25 packet transmissions from the combined location area to one of either the 2G core network or the 3G core network.

The radio access network comprising the BSS 302 may switch the packet transmissions from mobile terminals to a respective one of the two core networks in dependence on a number of factors. For example the packet
30 transmissions may be switched in dependence on the capacity of the respective networks, the type of mobile

terminal from which the packet originated, the capabilities of the mobile from which the packet originated, or the 2G cell in which the mobile terminal is connected in the location area LA3.

The packet transmissions can also be switched depending on the capacity of the respective core networks, each network including a mobile switching centre MSC comprising a visitor location register VLR, the capacity of the respective core networks being determined by the capacity of its VLR.

Although the radio access network having the switching capability is the preferred implementation of the improved network architecture for implementing the combined location area, other implementations may be possible. For example, the standard BSS 204 of Figure 2 may be utilised, with the 2G core network being modified to include 3G functionality, and some control mechanisms to select between the 2G and 3G functionality being added within the 2G core network. This implementation is less preferable than the implementation shown in Figure 3 since it requires modifications to the 2G core network.

The technical feature which enables the 'overlaying' of the location areas LA1 and LA2 to be implemented is the provision of a single radio access network (the BSS 302) which connects the user terminals in the two location areas to both the 2G and 3G functionality in the core network.

In addition, the network architecture of Figure 3 may be extended to network architectures in which the location areas only partially overlap. That is, in the 2G/3G scenario described hereinabove the 3G location area fits completely into the 2G location area, and the 2G location area is bigger than the 3G location area. That is, the 3G location area fully coincides with the 2G location area. However, the principle of 'overlaying' location areas may extend to location areas which do not exhibit this characteristic.

In addition, the principle of 'overlaying' location areas may extend to more than two location areas, and may extend to more than two core networks. For example, in the future the radio access network provided by the BSS 302 may have the added capability of switching to a 4th Generation (4G) core network.

location area LA3. However, if a common location area identifier were used then the mobile terminals in the common location area 300 would not be able to distinguish between the one of the core networks in which communication is established.

- 5 In accordance with a further modification, the location area identifier for the common location are 300 is provided with a core network identifier field to distinguish between the 2G and 3G core networks.

Referring to Figures 4(a) and 4(b), there is illustrated an implementation of the location area identifiers transmitted by the 2G and 3G core networks respectively. Preferably the location area identifier is a 16 bit sequence. In accordance with this improvement, the core network identifier field to distinguish between the 2G and 3G core network is the first bit of the 16 bit location area identifier. The first bit of the sequence is set to either 0 or 1 to indicate 2G or 3G. That is, the core network in which the location area identifier originates sets this bit. The remaining 15 bits of the location identifier, containing the location area identifier (LAI) value will be identical. Thus the core network identifier filed of the location area identifier is a pointer to a core network.

Referring to Figure 4(a), the location area identifier 402 generated by the 2G core network has a first bit 404 which is set to 0, and the location area identity LAI 406. Referring to Figure 4(b), the location area identifier 403 generated by the 3G core network comprises a first bit⁴⁰⁸ which is set to 1, and the location area identifier value LAI 410.

Mobile terminals in the location LA3 may have 2G or 3G functionality. The mobile terminals having 3G functionality can disregard the bit 0 in the first bit position. As these mobiles preferably have dual mode functionality, then all broadcast messages from the radio access network having the appropriate location area identifier are received by these terminals as they receive all broadcast messages whether from the 2G or 3G core network. The mobiles having only 2G functionality read the first

Claims

1. A packet switched mobile network architecture (Fig.3) comprising a location area (300) connected by a radio access network (302) to at least two core networks (212, 214) having differing functionality, wherein the radio access network
5 comprises switching means operative to switch packet transmissions from a mobile terminal in the location area to one of the at least two core networks (212, 214) in which the switching means is operative to switch packet transmissions from the mobile terminal to one of the at least two core networks (212, 214) in dependence on the capacity of the respective core networks.
- 10 2. The packet switched network of claim 1 in which each core network (212, 214) includes a mobile switching centre (MSC) comprising a visitor location register (VLR), the capacity of the respective core networks being determined by the capacity of the respective visitor location register VLR.
3. A method of switching packet transmissions in a packet switched
15 mobile network comprising a location area (300) connected by a radio access network (302) to at least two core networks (212, 214) having differing functionality, the method comprising switching by the radio access network of packet transmissions from a mobile terminal in the location area to one of the at least two core networks (212, 214) in dependence on the capacity of the respective networks.

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference M. ROBERTS 7-	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/EP 00/ 05708	International filing date (day/month/year) 20/06/2000	(Earliest) Priority Date (day/month/year) 20/08/1999
Applicant LUCENT TECHNOLOGIES INC.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

5



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 00/05708

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q7/22 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BERRUTO E ET AL: "ARCHITECTURAL ASPECTS FOR THE EVOLUTION OF MOBILE COMMUNICATIONS TOWARD UMTS" IEEE JOURNAL ON SELECTED AREAS IN COMMUNICATIONS,US,IEEE INC. NEW YORK, vol. 15, no. 8, 1 October 1997 (1997-10-01), pages 1477-1486, XP000721279 ISSN: 0733-8716 abstract	1,4
Y	page 1479, left-hand column, paragraph 4 page 1480, left-hand column, paragraph 2 -page 1481, left-hand column, paragraph 4; figures 1,2 ----- -/--	2



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

19 October 2000

Date of mailing of the international search report

26/10/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Blanco Cardona, P

INTERNATIONAL SEARCH REPORT

International Application No.

PCT/EP 00/05708

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB 2 315 193 A (ORANGE PERSONAL COMM SERV LTD) 21 January 1998 (1998-01-21)	2
A	page 6, paragraph 1 -page 8, paragraph 1 page 11, line 4 - line 15	1,3,4
A	page 13, paragraph 3 -page 14, paragraph 2 --- US 5 854 985 A (LEEDOM JR CHARLES M ET AL) 29 December 1998 (1998-12-29) abstract -----	2,3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/05708

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 2315193 A	21-01-1998	AU 1608997 A	02-02-1998
		EP 0910924 A	28-04-1999
		WO 9802008 A	15-01-1998
		ZA 9705864 A	25-01-1999
<hr/>			
US 5854985 A	29-12-1998	AU 1674495 A	03-07-1995
		CA 2179151 A	22-06-1995
		EP 0734636 A	02-10-1996
		WO 9517077 A	22-06-1995
<hr/>			